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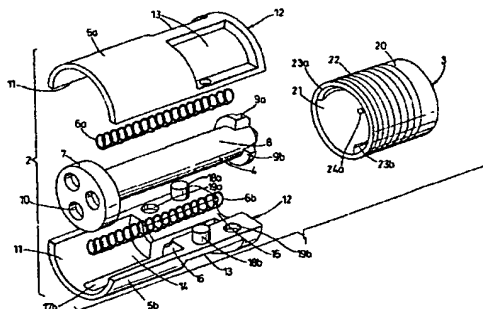
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: PANEL CONNECTOR



(57) Abstract: A self-ejecting connector (1) comprises a fastener means (2) and a retaining means (3). The fastener means (2) comprises a stud (4), a sleeve (5) having two complementary parts (5a, 5b), and two springs (6a, 6b). The stud (4) and the springs (6a, 6b) are assembled within the sleeve parts (5a, 5b) which are then glued or welded together to form the fastener means (2). The stud (4) comprises a head portion (7) and a shaft portion (8). Engagement lugs (9a, 9b) are formed on the end of the shaft portion (8). The sleeve (5) has a bore (11) and an end face (12). The bore (11) has a wide part (14) to accommodate the head (7) of the stud (4) and a narrow part (15) to accommodate the shaft (8). The stud (4) is retained within the assembled sleeve (5) with the stud (4) being movable along the bore (11) between a fully retracted position and an extended position. The springs (6a, b) are positioned in grooves (17a, b) in the bore (11). The head (7) of the stud (4) rests against the ends of the springs (6a, b) and the springs (6a, b) are compressed as the stud (4) is moved along the bore (11) of the sleeve (5). When pressure on the stud (4) is released, the springs (6a, b) bias the stud (4) back to the retracted position. The retention means (3) comprises a collar (20) with a bore (21). The bore (21) of the collar (20) is formed with two retaining blocks (23a, b) for engagement with the lugs (9a, b). Two stops (24a, b) are further included to limit the rotation of the lugs (9a, b) and prevent accidental disengagement of the connector (1).

WO 02/093024 A1

PANEL CONNECTOR

The invention relates to a connector for disengageably fastening two parts together, for example, two panels or a panel and a post such as for the assembly of modular boxes or furniture.

A number of different types of connector for fastening two panels together at right angles to one another are known. A commonly used connector for fastening two panels together such that they can also be disconnected easily is known as a cam and dowel connector. This type of connector comprises two parts, an attachment pin or dowel, which is fixedly mounted in the face of a first panel, and a rotatable clamping pin which includes a cam track mounted in the other panel. There are a number of different arrangements of this type of connector available but they all operate in a similar manner in which the head of the dowel is inserted into the clamping pin and the pin is rotated such that the cam draws the head of the dowel into the clamping pin to pull the two panels together. This type of fastening provides an easily disengageable fastening but it has the disadvantage that the attachment pin extends out from the surface of the first panel. This is a particular disadvantage for panels of modular boxes as the pins are easily damaged or dislodged.

An alternative type of fastener is known for fastening two panels face to face. This type of fastener is usually known as a quarter-turn fastener or a self-ejecting fastener. Fasteners of this type generally comprise a stud with a head and a shaft that is inserted from one face of one panel through a hole passing through both the panels to engage with a receptacle positioned on the opposite face of the other panel. The stud is rotated so that an engagement means on the end of the shaft engages with a receiving means in the receptacle. In self-ejecting versions of the fastener a spring means surrounds the shaft and biases the stud away from the receptacle to cause the stud to be ejected when the engagement means is released from the receiving means in the receptacle. This type of fastener is not suitable for fastening two panels at right angles.

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A further problem with self-ejecting fasteners is the positioning of the spring means on the shaft of the stud. If the spring is fitted over one end of the shaft, it is possible for the spring to slip off again. Alternatively, the spring may be wound onto the shaft, though this is a relatively awkward and expensive operation for connectors of this type which are high volume, low cost items. A further alternative is to make the shaft in two parts so that the spring can be fitted before the shaft is fully assembled. However, this involves an extra manufacturing step, with a consequent increase in complexity and expense.

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Another problem with self-ejecting fasteners is that they are generally not suitable for injection moulding from plastics material.

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It is an object of the present invention to provide an improved self-ejecting connector.

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The invention provides a self-ejecting connector for disengageably fastening a first part and a second part together in accordance with claim 1 of the appended claims. The invention further provides a self-ejecting connector for disengageably fastening a first part and a second part together in accordance with claim 19 of the appended claims.

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The invention provides a self-ejecting connector for disengageably fastening a first part and a second part together, comprising:

fastener means for mounting on the first part, the fastener means comprising a stud comprising a head portion and a shaft portion and further comprising engagement means on the shaft portion, a sleeve for accommodating the shaft portion of the stud, and spring means; and

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retaining means for mounting on the second part comprising retention means for co-operation with the engagement means on the shaft portion of the fastener means,

characterised in that:

the sleeve of the fastener means comprises a bore that accommodates the shaft portion of the stud and an end face positioned adjacent the shaft portion between the head portion and the engagement means;

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- the head portion and shaft portion of the stud are movable along the bore of the sleeve;
- the sleeve comprises a cylinder formed from two or more lengthwise sections; and
- 5 the spring means is arranged in the bore between the end face of the sleeve and the head portion of the stud, the spring means acting to bias the stud back into the sleeve.

- Preferably the sleeve, stud and retaining means are formed by injection
- 10 moulding of plastics material. Advantageously a polycarbonate material may be used, though any suitable materials may be used.

- The sleeve is preferably adapted to be inserted in an elongate hole in the first part. Preferably the sleeve portion slides into the hole in the first part.
- 15 Advantageously there is no need to fix it within the hole. Advantageously the elongate hole has a smaller diameter through-hole through which the engagement means can pass but which retains the sleeve. Advantageously the elongate hole is dimensioned such that the fastener means is within the panel when it is fully retracted. Preferably the sleeve comprises a cylinder.
- 20 Preferably the sleeve comprises a cylinder cut lengthways to form two similar parts. This enables the sleeve to be moulded more easily. The two parts are preferably formed with complementary fixing means to hold them in position relative to each other when the fastener is assembled. Preferably the sleeve comprises two identical parts fitting together.

- 25 Preferably the sleeve is moulded in two parts and is assembled with the stud and the spring means and welded or stuck together to form the fastener means. More than two longitudinal sections are also possible but two is generally preferable as this is simpler for moulding and assembly.
- 30 Preferably the sleeve parts are glued or welded together when the fastener is assembled. In this way, the connector can be provided to a user as a two-part connector comprising the fastener assembly and the retaining means.

- Preferably if the sleeve is formed by injection moulding, the moulding has
- 35 reduced diameter portions to reduce the amount of plastics material used.

Preferably the stud is formed, advantageously by injection moulding, as one piece. This is cheaper to manufacture and simplifies the assembly of the fastener means.

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Preferably the stud head does not extend beyond the end of the sleeve when the stud is fully retracted in the fastener means. Advantageously the engagement means are moved to a position adjacent the outer face of the end face of the sleeve when the stud is fully retracted.

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In a preferred embodiment of the invention, the spring means comprises at least two springs, such as coil springs, arranged in the bore adjacent the shaft portion between the end face of the sleeve and the head portion of the stud, the spring means acting to bias the stud back into the sleeve.

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Preferably there are two springs positioned on opposite sides of the shaft. Preferably the spring means are arranged in grooves in the bore of the sleeve. Preferably the groove is slightly tapered towards the top to retain the spring within the groove.

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This arrangement has the further advantage that the springs can be very small diameter. Additionally, there is no need for the spring to be fitted over the shaft, thus making the fastener simpler to manufacture and assemble.

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Preferably the retaining means comprises a fixing bush or collar and is mounted in a hole in the second part. Preferably the bush or collar is ridged or oversized with respect to the hole to form a "knock-in" fit. Alternatively it can be mounted by a screw fitting or other suitable means.

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Preferably the retaining means comprises retention blocks for engagement with the engagement means on the shaft of the fastener means. Advantageously the retaining means further comprises at least one bar or stop to prevent over-rotation and, therefore, accidental disengagement of the engagement means from the retention blocks.

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Preferably the fastener means is engaged with the retaining means by a quarter turn of the stud.

Preferably the spring means acts to retract the stud from the retaining means and to withdraw the stud back within the sleeve when the engagement means is released.

The invention will now be described by way of example only with reference to the drawings, of which:

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Figure 1 shows an exploded view of a connector according to the invention;

Figure 2 shows a side view of the interior of the sleeve shown in Figure 1;

Figure 3 shows a side view of the stud shown in Figure 1;

Figure 4 shows an end view of the retaining means shown in Figure 1.

15 Figure 5 shows a cross-sectional view of a connector according to the invention mounted in two panels to be fastened together; and

Figure 6 shows the panels and connector of Figure 5, when fastened together.

20 As shown in the Figures, a connector 1 in accordance with the invention comprises a fastener means 2 and a retaining means 3. The fastener means 2 comprises a stud 4, a sleeve 5 having two complementary parts 5a,5b, and two springs 6a,6b. The stud 4 and the springs 6a,6b are assembled within the sleeve parts 5a,5b which are then glued or welded together to form the

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The stud 4 comprises a head portion 7 and a shaft portion 8. Engagement lugs 9a,9b are formed on the end of the shaft portion 8. Keyhole means 10 are formed in the head portion 7 for engagement by a co-operating key (not shown) to rotate the stud 4. The keyhole means 10 may comprise a simple slot or crossed slots for engagement by a standard screwdriver or it may comprise an individual keyhole arrangement that can only be engaged by a specific key means. This arrangement provides added security as the connector 1 can then only be engaged and disengaged by the correct key.

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The two parts of the sleeve 5 are advantageously identical, with consequent reduction in moulding requirements. The sleeve 5 has a bore 11 and an end face 12. It may be further advantageous to have recessed portions 13 in the outer surface of the sleeve 5, to reduce the plastics material required for each moulding.

The bore 11 has a wide part 14 to accommodate the head 7 of the stud 4 and a narrow part 15 to accommodate the shaft 8. The stud 4 is retained within the assembled sleeve 5 with the stud 4 being movable along the bore 11 between a fully retracted position, as shown in Figure 5, in which the engagement lugs 9a,b are retracted towards the end face 12, and an extended position, as shown in Figure 6, in which the head 7 is moved towards an inner face 16 of the narrow part of the bore 15 and the engagement lugs 9a,b are moved away from the end face 12.

The springs 6a,b are positioned in grooves 17a,b in the bore 11. The grooves 17a,b are advantageously reverse tapered to retain the springs 6a,b within them when the fastener 2 is assembled. The head 7 of the stud 4 rests against the ends of the springs 6a,b and the springs 6a,b are compressed as the stud 4 is moved along the bore 11 of the sleeve 5. When pressure on the stud 4 is released, the springs 6a,b bias the stud 4 back to the retracted position.

The two parts of the sleeve 5a,b further comprise fixing studs 18a,b and holes 19a,b to ensure that the two parts of the sleeve 5a,b are correctly positioned when the fastener 2 is assembled.

The retention means 3 comprises a collar 20 with a bore 21. The external face of the collar 20 may be formed with press-fitting ridges or a screw thread 22.

The bore 21 of the collar 20 is formed with two retaining blocks 23a,b for engagement with the lugs 9a,b. Two stops 24a,b are further included to limit the rotation of the lugs 9a,b and prevent accidental disengagement of the connector 1.

In use, the fastener 2 is inserted in an elongate hole 25 through a first panel 26. The bore of the elongate hole 25 is wide enough to accommodate the sleeve 5 as a slide fit and has a narrower portion 27 through which the engagement lugs 9a,b of the stud 4 can pass but which retains the sleeve 5 within the elongate hole 25. The sleeve 5 does not need to be screwed or glued in the elongate hole 25 but just slides into it. The narrower portion 27 has a sufficient depth such that the whole of the stud 4 can be retracted within the panel 26 when the connector 1 is not engaged.

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The retaining means 3 is inserted in a hole 28 in a second panel 29. The retaining means 3 is held within the hole 28 by a screw thread, by press fitting, by gluing or by other suitable means to hold it securely in position.

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In the arrangement shown, the fastener 2 is inserted in an elongate hole 25 through the faces 26a,26b of panel 26 and the retaining means 3 is inserted in a hole 28 in the end 29a of the panel 29. Alternative arrangements using panels formed with battens or corner posts are also possible.

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When the connector 1 is to be engaged, as shown in Figure 6, the two panels 26, 29 are brought together. A screw-driver or other key means (not shown) is engaged with the keyhole means 10 and the stud 4 is pushed along the sleeve 5 until the engagement lugs 9a,b enter the retaining means 3. Slight rotation of the stud 4 may be required to enable the lugs 9a,b to pass the blocks 23a,b. Once the lugs 9a,b have passed the blocks 23a,b, the stud 4 is rotated to engage the lugs 9a,b behind the blocks 23a,b. The stops 24a,b ensure that the stud 4 is not over rotated to disengage the lugs 9a,b again. The springs 6a,b bias the stud 4 back into the sleeve 5 and thus hold the lugs 9a,b against the blocks 23a,b. The connector 1 is thus held firmly in an engaged position until released by a user. To release the connector 1, the key means is engaged with the keyhole means 10 and the stud 4 is rotated away from the stops 24a,b to release the lugs 9a,b from the blocks 23a,b to allow the stud 4 to be withdrawn from the retaining means 3. The springs 6a,b act to retract the stud 4 back into the sleeve 5 to the retracted position.

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The connector 1 has the advantage that the stud 4 and the sleeve 5 are not attached to the first panel 26, only inserted in a hole 27 in it. They are connected to the retaining means 3 fixed in the second panel 29.

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The preferred embodiment of the invention, with two, or more, springs 6a,b positioned adjacent the shaft 8 of the stud, in contrast to prior art devices in which a spring is arranged around the shaft, has advantages in simplified manufacture and assembly.

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Connectors of this type are manufactured in high volumes and it is advantageous to have very low individual item costs. The simpler the manufacturing process, then the lower the cost can be.

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The connector of the invention has many advantages over prior art connectors, particularly in that it can be easily engaged and disengaged when required and in that, when disengaged, all the parts of the connector can be within the plane of the panel or post in which they are mounted.

CLAIMS

1. A self-ejecting connector for disengageably fastening two parts together, comprising:
- 5 fastener means for mounting on the first part, the fastener means comprising a stud comprising a head portion and a shaft portion and further comprising engagement means on the shaft portion, a sleeve for accommodating the shaft portion of the stud and spring means; and
- retaining means for mounting on the second part comprising
- 10 retention means for co-operation with the engagement means on the shaft portion of the fastener means,
- characterised in that:
- the sleeve of the fastener means comprises a bore that accommodates the shaft portion of the stud and an end face positioned adjacent the shaft
- 15 portion between the head portion and the engagement means;
- the head portion and shaft portion of the stud are movable along the bore of the sleeve;
- the sleeve comprises a cylinder formed from two or more lengthwise sections; and
- 20 the spring means is arranged in the bore between the end face of the sleeve and the head portion of the stud, the spring means acting to bias the stud back into the sleeve.
2. A connector according to claim 1 wherein the sleeve, stud and
- 25 retaining means are formed by injection moulding of plastics material.
3. A connector according to claim 1 or claim 2 wherein the sleeve comprises a cylinder cut lengthways to form two similar parts.
- 30 4. A connector according to any one of the preceding claims wherein the parts of the cylinder are formed with complementary fixing means to hold them in position relative to each other when the fastener is assembled.
5. A connector according to any one of the preceding claims wherein
- 35 the sleeve is moulded in two or more parts and is assembled with the stud

and the spring means and welded or stuck together to form the fastener means.

6. A connector according to any one of the preceding claims wherein
5 the stud head does not extend beyond the end of the sleeve when the stud is fully retracted.

7. A connector according to any one of the preceding claims wherein
the engagement means are moved to a position adjacent the outer face of the
10 end face of the sleeve when the stud is fully retracted.

8. A connector according to any one of the preceding claims wherein
the spring means comprises at least two springs arranged in the bore
adjacent the shaft portion between the end face of the sleeve and the head
15 portion of the stud, the spring means acting to bias the stud back into the sleeve.

9. A connector according to claim 8 wherein there are two springs
positioned on opposite sides of the shaft.
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10. A connector according to claim 8 or claim 9 wherein the spring
means are arranged in grooves in the bore of the sleeve.

11. A connector according to claim 10 wherein the groove is slightly
25 tapered towards the top to retain the spring within the groove.

12. A connector according to any one of the preceding claims wherein
the retaining means comprises a fixing bush or collar.

30 13. A connector according to claim 12 wherein the bush or collar is mounted in a hole in the second part and is ridged or oversized with respect to the hole to form a "knock-in" fit.

14. A connector according to claim 12 wherein the bush or collar is
35 mounted by a screw fitting or other suitable means.

15. A connector according to any one of the preceding claims wherein the retaining means comprises retention blocks for engagement with the engagement means on the shaft of the fastener means.

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16. A connector according to claim 15 wherein the retaining means further comprises at least one bar or stop to prevent over-rotation and, therefore, accidental disengagement of the engagement means from the retention blocks.

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17. A connector according to any one of the preceding claims wherein the fastener means is engaged with the retaining means by a quarter turn of the stud.

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18. A connector according to any one of the preceding claims wherein the spring means acts to retract the stud from the retaining means and to withdraw the stud back within the sleeve when the engagement means is released.

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19. A self-ejecting connector for disengageably fastening two parts together, comprising:

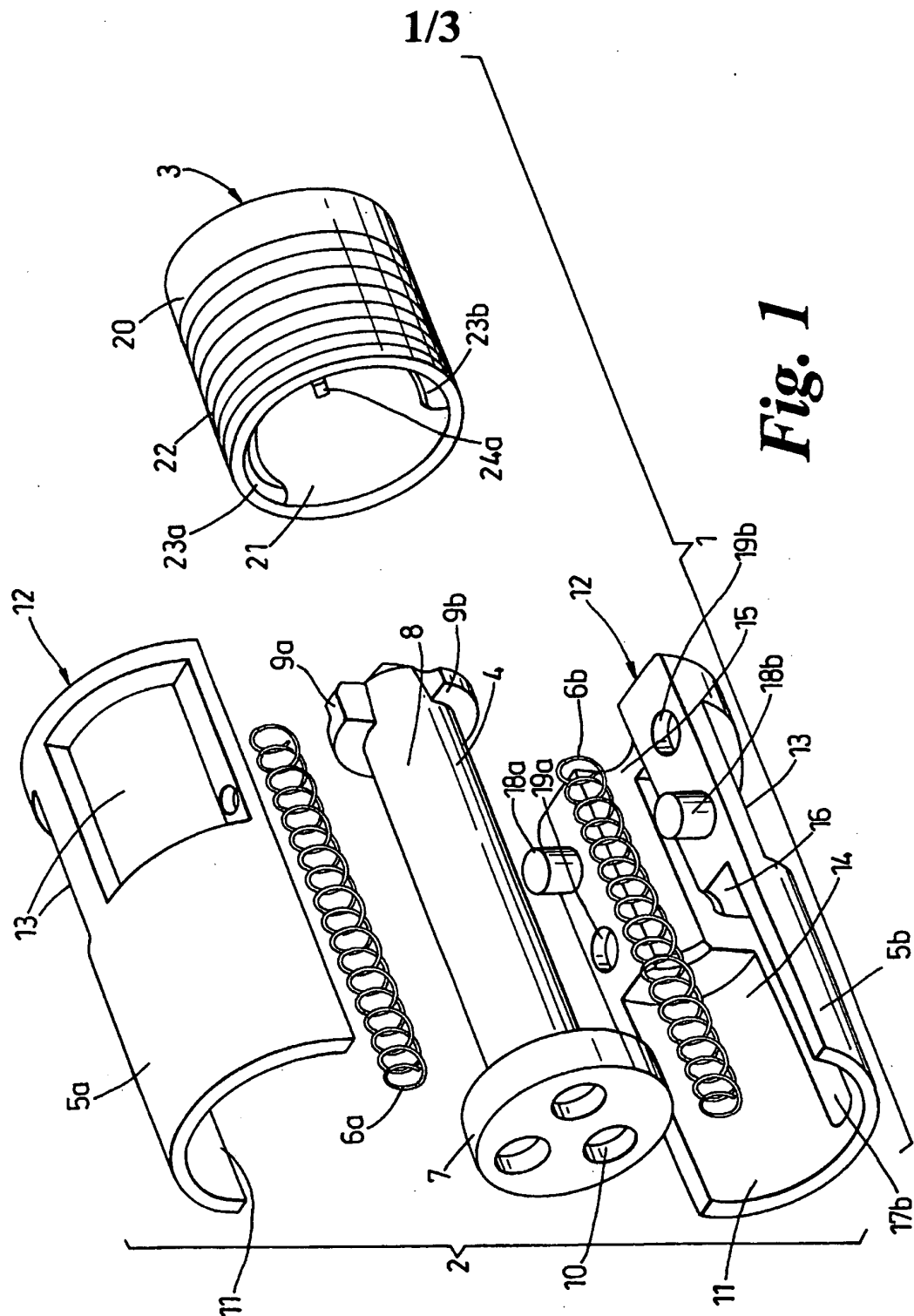
fastener means for mounting on the first part, the fastener means comprising a stud comprising a head portion and a shaft portion and further comprising engagement means on the shaft portion, a sleeve for
25 accommodating the shaft portion of the stud and spring means; and

retaining means for mounting on the second part comprising retention means for co-operation with the engagement means on the shaft portion of the fastener means,
characterised in that:

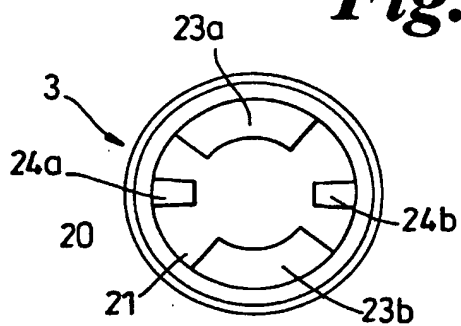
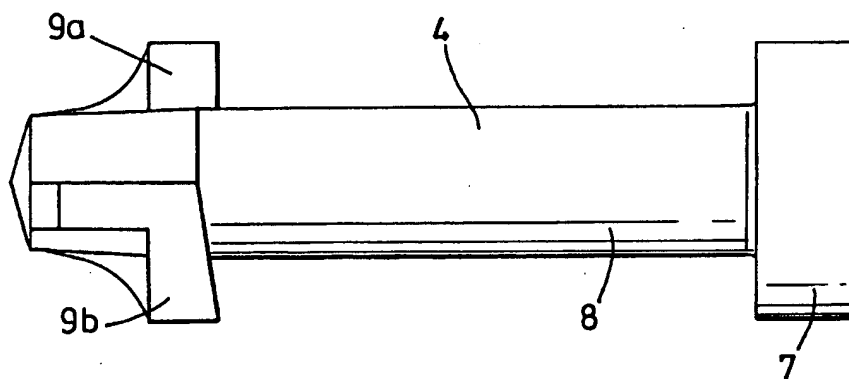
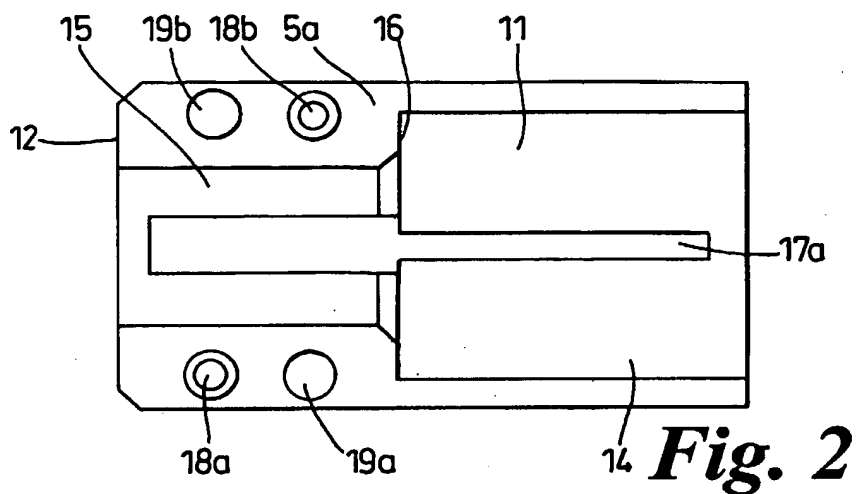
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the sleeve of the fastener means comprises a bore that accommodates the shaft portion of the stud and an end face positioned adjacent the shaft portion between the head portion and the engagement means;
the head portion and shaft portion of the stud are movable along the bore of the sleeve; and

the spring means comprises at least two springs arranged in the bore adjacent the shaft portion between the end face of the sleeve and the head portion of the stud, the spring means acting to bias the stud back into the sleeve.



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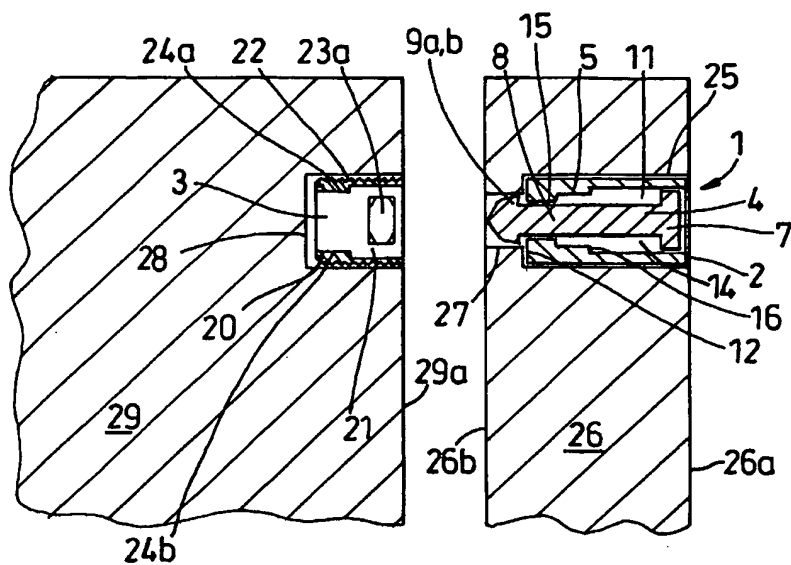


Fig. 5

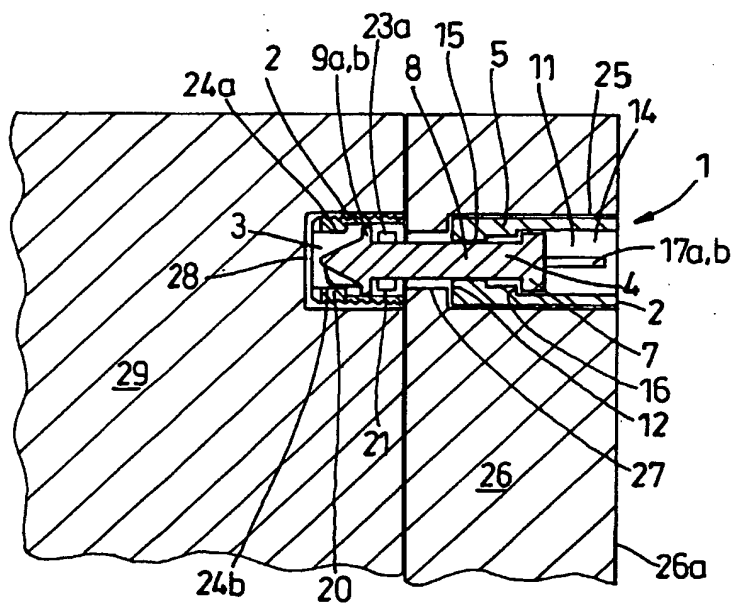


Fig. 6

INTERNATIONAL SEARCH REPORT

I. International Application No.

PCT/GB 02/02298

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 F16B21/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 F16B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	EP 0 949 424 A (HAEFELE GMBH & CO) 13 October 1999 (1999-10-13) abstract column 6, line 48 -column 7, line 3 figures 10,11	1,3,4,6, 7,12-18
Y	GB 706 087 A (WILLIAM DZUS) 24 March 1954 (1954-03-24) page 2, left-hand column, line 4 - line 12; figures 1,3	19

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
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- *P* document published prior to the international filing date but later than the priority date claimed

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19 August 2002

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 02/02298

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT

Information on patent family members

In national Application No

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